

Space Cadets: Moon Calling

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Tom Krikrit carefully pushed the throttle to accelerate the shuttle out of low earth orbit, while his brother Tim, sitting at his communications console at Moon Base One, monitored the status of the spacecraft's systems.

"Shuttle to Moon One, leaving earth orbit, on course for the moon," said Tom.

"Roger that, shuttle," replied Tim. "All systems normal."

With the older radio technology, it would have taken more than one second for Tom's radio signal to travel to the moon, and the same amount of time for Tim's reply to travel back to earth, but they were using the new quantum communications transceiver that allowed for instantaneous communications over any distance.

Suddenly there was a loud bang.

"Mayday!" shouted Tom. "Space junk collision! Shuttle may have been damaged!"

"Fuel pressure dropping!" exclaimed Tim excitedly.

Tom frantically scanned his monitors to determine the status of the ship. "Main rocket engine damaged!" he bellowed. "Shutting down now!"

But just at that moment, another voice broke in over the quantum communications transceiver. "Boys," it said, "that's enough now."

Tom seemed startled. "What's that?" he cried. "It must be a space alien hacking into our communications!"

"It's no space alien," said the voice. "It's your mother, and dinner's ready!"

Tom sighed. There was nothing he could do but click "pause game" on his computer console, then save the shuttle simulator

program so he could continue it later, because his space shuttle was actually his father's study, Moon Base One was actually their bedroom upstairs, the loud bang came from his hitting a pot lid against his father's desk, and the quantum communications transceiver was actually the intercom system installed in the Krikit family home in Los Angeles, California.

If he had to wait to continue his space adventure, at least his mother was serving his favorite meal--baked acorn squash with brown sugar and butter, together with falafel nuggets and a side of smoky campfire beans. Their mother served up the meal and then gave them a reminder.

"Your father will be calling at seven," she said, "so we need to finish eating before then."

Their father, as it happened, was the *real* commander of the *real* Moon Base One, which had been constructed and was operated by Moonco, a corporation with offices in Los Angeles. Being as the quantum communications transceiver had not actually been invented yet, there would in fact be a two and a half second delay between speaking and getting a reply when talking to their father, but the boys were used to that. Commander Krikit had been on duty at the station now for over a month and he called home several times a week.

After a delicious dessert of strawberry pie with graham cracker crust, it was time for the call, and the boys rushed to the living room. By the time their mother joined them, they had opened Skype on the family computer and were waiting for their father to contact them. It didn't take long. Tom answered the call and his father's image splashed onto the screen.

"Hi boys," he said. "How is everything?"

"I was hit by space junk just before dinner!" said Tom. "But I think I'll be able to work through it all right and get back safely, with Tim's help, of course."

"Space junk!" said his father. "That can be a real problem. I worry about that myself every time I go into low orbit. But listen,

I have some news for you. I've arranged for the two of you to visit me here at Moon One. How would you like that?"

If the boys had accidentally grabbed hold of a live power feed from the solar panels mounted on the roof, they could not have been more electrified.

"Wow! Wow!" they sang out, leaping up and dancing in circles just like Comanche warriors, that being the tribe of Native Americans that their mother was descended from. "Moon One! Moon One!" they shouted.

Their mother knew that the trip had been arranged, but had left it to their father to give them the news. "You'll leave in two weeks," she said. "You'll need to attend a training course and have medical exams, but if everything is OK, you'll be able to go, and you'll have ten days with your father."

The boys could hardly sleep that night. The full moon rose in their east-facing bedroom window as the long summer day finally ended and the sun set in the west. Tim got out of bed and went to the telescope to have a look.

"You can't see him," said Tom. "It's too far away."

"I know," said Tim, adjusting their eight inch Schmidt-Cassegrain telescope to point to the lunar north pole where Moon One was located. "But I like to look anyway."

The station was at Peary Crater. It was possible, but very difficult, to see the crater by telescope, and though Tim had tried many times, he'd never managed to find anything that looked quite like the photograph of it the boys had hanging on their bedroom wall.

After a few minutes, he gave up, then turned to his brother. "Are you afraid?" he asked.

"No," said Tom bravely, but there was something in his voice that betrayed a slight anxiety. The risk of collision with space junk could not be eliminated completely, though NASA did an excellent job of tracking it these days, even cleaning up the worst of it, and there hadn't been a serious collision in decades.

“Me neither,” said Tim, determined that, if his brother wasn’t afraid, he wouldn’t be either. He got back into bed and the boys lay quietly for some time, each trying to imagine in his own way what a trip to the moon would be like. They had seen plenty of photos, videos and news reports about it, but still, actually going there would be nothing short of glorious. Heads filled with visions of voyaging through the starry blackness of space, they finally managed to fall asleep.

* * *

The boys completed their training in shuttle emergency procedures and passed their medical exams with no problems. When the day finally arrived, they were up earlier than usual, and after breakfast, rode with their mother in the family’s self-driving car to the spaceport at Barstow in the Mohave Desert. There she bade them farewell as they passed through the security checkpoint. She knew that space travel was almost as safe, if not safer, than travel on earth these days, but she was a mother, and couldn’t help being concerned any time her boys were sent off on their own, whether it was a field trip to the zoo or, in this case, a trip to the moon. “Call me!” she said, as they left her and passed through the security scanners.

The shuttle to the low earth orbit transfer station was small, with seats for just eight passengers. There were no crew because the flight was entirely automated, such flights having become so reliable that pilots were totally unnecessary. Their father had told them that at one time, long ago, even elevators needed professional operators, before they had made them automatic, and the boys were amazed at that.

After identifying themselves at the boarding kiosk, they waited for the announcement of their flight, then descended with the other passengers by elevator to the shuttle, which lay a hundred meters underground. The craft would be accelerated via

electromagnetic rail, powered by solar energy, along a ten kilometer underground tunnel, pressing them back against their seats at a tolerable five G's as they sped up to Mach 10 before popping out of the ground in the desert, where the shuttle's rocket engine would ignite and accelerate them to Mach 33, the escape velocity needed to achieve low earth orbit. They would rendezvous with the low orbit station, where they would transfer to the larger lunar shuttle that ran a regular round trip from the station to the moon and back.

As they entered the small shuttle craft through the hatchway, the brothers presented an outward appearance of calm and sophistication. To look at them, you might think that a shuttle trip into space was a routine occurrence for the boys. On the inside, though, they were as giddy as monkeys. They found their seats and sat down together, first Tom, and then Tim, to his left. The seat to Tom's right was empty, but before long, a passenger came to claim it. It was a girl.

Tom could tell from the blue shirt she wore with a curvy "N" on it that the girl was a "Navigator", a member of the scouting organization that had mostly replaced the separate boys' and girls' organizations that their parents had belonged to. Not only that, the shirt was covered with achievement badges that she had earned after gaining proficiency in a number of skills. The girl looked at him and smiled smugly. Tom could tell right away that he wasn't going to like her.

They strapped in and before long the computers announced that the cabin was secure and that they were about to begin the acceleration to Mach 10. It took about a minute to travel down the tube, during which time they accelerated at a rate of fifty meters per second per second. There were no windows in the shuttle, but the "kick" that the ship experienced when they had reached the end of the tube and the rocket ignited told them they had left the ground. From then on it was just a few more minutes before the rocket engine cut out and they were floating in space.

It was the first time the boys had experienced weightlessness, of course. They had taken pills that morning to prevent space sickness, so they had no problem with that. But when Tim felt himself drifting against his harness straps, it gave him a funny feeling. "Whoa!" he exclaimed.

"First time?" asked the girl. Evidently it was not, for her.

"We've never wanted to go to the moon, before now," replied Tom calmly. "But our father is commander of Moon One, so we have to go there to visit him."

The girl gave him a prim, tight-lipped smile. She knew that he was only pretending to be so casual about a trip into space. "How interesting. Your father is Commander Charles Krikit? My mother is Evelyn Bascomb, the CEO of Moonco. I've been to the moon three times already. This will be my fourth trip."

This information confirmed Tom's initial opinion of the girl. He had overheard his father complaining to their mother about Moonco's management of Moon One. Even so, and despite his unfavorable first impression of the girl, he knew enough to be a gentleman about it, and held out his hand.

"I'm Tom, and this is my brother, Tim," he said.

The girl took his hand and gave him a firm handshake. "I'm Nancy. Nice to meet you." Tim leaned forward and acknowledged the acquaintance with a quick nod and a wave of his hand.

The docking went smoothly and soon the boys and the other passengers scheduled for the lunar shuttle were floating around the orbital station's large waiting room, passing the time by gawking at the panoramic view of earth from the station's large, bubble-shaped observation window.

Nancy made her way over to the brothers and then pointed down at the continent of Africa which was just then passing by below. "I live in Africa," she said. "Botswana, in Kasane, near the Chobe National Park." It was, Tom knew, one of the wealthiest cities on earth, where most of the world's business and financial leaders took up residence.

"Where?" asked Tim, looking down at the landscape of the continent.

"You can't see it," she replied. "It's farther south, over the horizon."

"We live in Los Angeles," said Tim.

"Oh," said Nancy. "I've heard that Los Angeles is doing better these days since they built the new spaceport."

"I like it well enough," said Tom. "Botswana is hot, though, isn't it?"

"If you go outdoors", she replied, "but I almost never do, only on Navigator trips, mostly. I have an achievement badge in wildebeest." She pulled at the sleeve of her shirt, showing them an embroidered patch with a picture of that animal's narrow head, enormous lips and tightly curved horns.

There was one other young person in the waiting room, a girl wearing a pink head scarf, who had overheard their conversation and drifted over to them. "I'm from Tunisia," she said, "from the mountains. You can see it, just there." She pointed at a rugged coastline visible along the edge of the blue waters of the Mediterranean Sea. The loose ends of her scarf were floating free and one of them wandered in front of her face, so she pulled it down and tucked it in.

"I'm Tim, Tim Krikit," said Tim, holding out his hand to her. "Sometimes people call me Timminy but I don't like it."

"I'm Henu," said the girl, giggling at his humorous remark and reaching out her own hand. But when they tried to shake hands, because they were floating in zero gravity, they twirled each other around, as if they were dancing.

"Oh!" cried Henu, who let go, causing them to drift apart, hands and legs flailing in air until they could find a handhold to stabilize themselves.

Nancy and Tom laughed at them. "You look like a couple of birds, flapping around like that," said Tom.

A few minutes later it was time to board the moon shuttle. It was a large spacecraft, and because the trip would take three days, the passengers had their own rooms, like on a cruise ship. Tim and Tom found the cabin they were sharing and strapped themselves into their chairs, which would also serve as their sleeping couches. But for now they were in no mood for sleep. They were about to go to the moon!

When the computers determined that all passengers were secured in their seats, the announcement came that the ship was leaving low earth orbit station. There were no windows, but they could watch on the video monitor in their room as the ship undocked from the station, and they could also hear the metallic clink of the undocking and feel the slight movement. After the twenty minutes it took to maneuver a safe distance from the station, the computers announced the countdown to the rocket ignition that would send them on their way.

Five! Four! Three! Two! One! Zero! They heard a roaring noise and felt themselves pressed against their seats. The ship shuddered slightly and on the video monitor they saw the station disappear quickly from view. The rocket burned for just two minutes, then shut down. That was all it would take to send them the rest of the way to the moon. From then on, they would drift through space, no further rocket propulsion required, except for slight course adjustments, going farther and farther from earth and coming closer and closer to the moon, until finally, three days later, they would set down on that rocky, dusty landscape so far from earth, and home.

The computers had a few announcements to make, about meals and rules of conduct on board the ship, and how to find information about the entertainment systems, the zero gravity toilets and the showers. Finally, the computers gave an update on the space weather expected during the flight. There was no air, wind, rain, or snow like on earth, but there was “solar wind”, the strong current of electrically charged particles from the sun that

was mostly deflected from the earth by its magnetic field, but which flowed freely in space. A very large solar flare had been detected erupting on the surface of the sun, at least X30 in strength, but, the computers assured them, it was nothing to be concerned about, because the coronal mass ejection from it was not expected to cross their path and the ship had ample protection against charged particles, radiation, small meteors, and anything else they were likely to encounter. Then it was announced that they were free to unfasten their restraints and move about the cabin.

“We’re on our way!” shouted Tim.

“We sure are!”, replied Tom.

They unbuckled themselves and decided to explore the ship, and found that the other passengers had the same idea, because the narrow passageway was crowded. There was only one place to go though, and that was the lounge. Unlike lounges on earth, it had no seats, only places where passengers could tether themselves to the walls--not just the sides, but above and below also. From the lounge, a door led to the crew area, but it was closed. Unlike the small shuttle that had brought them from earth to the low orbit station, the larger moon shuttle had a crew of four--pilots who were trained and prepared to take over from the computers if, for any reason, the automated controls should fail. Mostly, though, the pilots had nothing to do but watch their panels to make sure nothing was amiss, maintain routine communications with earth and the moon, and eat and sleep.

The lounge did, however, have two narrow windows, one on each side. One faced the sun and was blacked out, but the other was open, and showed a panoramic view of the Milky Way, which from space looked like a huge dust storm swirling among the stars, but was actually made up of the one hundred billion stars of their home galaxy. The brothers stared at it for a long time, speechless. They had seen plenty of pictures of it, but seeing it from space was something else again.

Finally, Tim spoke up. "How much is one hundred billion, do you think?" he asked.

A very wrinkled man with white hair sticking out all over his head heard the question and gave an answer. "Well," said the man, "I know how much a billion is. If someone gives you a dollar once every second, for ten hours a day, for a month, you'll have a million dollars, but a billion is a thousand times more, which would take eighty years. So you would need, let's see, eighty times one hundred, that's eight thousand years, to get as many dollars as there are stars in the galaxy."

"Wow," said Tim.

"Yikes," said Tom. "That's a lot."

"Yes it is," said the man.

"Do you know a lot about space?" asked Tim.

The man rubbed his bushy chin before answering. "I know very little about space," he said honestly, "but even so, I know much more than most people. I'm an astronomy professor. In fact, I'm on this trip to make observations. The ship has been fitted with a number of devices that I can monitor from the crew cabin."

"You get to go to the front?" asked Tom excitedly.

The man laughed. "Yes, but it's not as much fun as you might expect. I have to listen to the crew making bad jokes all the time," he sighed.

"Like what?" asked Tom.

"Oh," said the man. "Like, for example, how many angels does it take to rotate a triclinic crystal?"

"I don't know," said Tim. "How many?"

"Three, but they need to be the 'wrong kind of angels'."

"You mean angles, not angels," said Tom. "A triclinic crystal has no right angles. They're not right angles, so they're the 'wrong' angles? That's not so funny."

"No," said the professor, "I didn't think so either, but the crew thought it was. Anyway, my name is Doctor Longston Bock, but you can call me Doc. What's yours?"

"Tim and Tom," replied Tom, pointing first to his brother, then to himself. "Krikit, but you can call us Tim and Tom."

"Ah!" said the man, laughing. "Your father is the commander of Moon One? Very good. Very good." The professor looked at his watch, then said, "Well, if you'll excuse me, I've done enough star gazing for now and it's time for me to do some astronomy. See you later boys." With that, he untethered himself and moved towards the door to the crew cabin. When the computers saw him approach, they opened the door and let him in, then shut it quickly again.

It was about lunch time and the boys were ready for something to eat. They went back to their cabin and asked the computers to show them the menu of vegetarian meals that their mother had requested when she made their reservation. What came out of the meal service compartment installed in their room was nothing like what their mother gave them at home, but they were hungry enough and ate it anyway.

Then they decided to call their mom, as they had promised. "Computers!" said Tom. "Call our mother!"

In a few moments her face appeared on the video screen and they heard her voice. "Hi boys," she said. "How are things?"

"Just fine," replied Tim. "We met an astronomer."

"He explained what one hundred billion is," added Tom.

"I could have told you that!" said their mother. "It's a lot!"

"Yes," said Tim. "That's what he said too. The food here isn't as good as yours, though."

That made his mother smile. "I'm sorry for that," she said. "But I'm sure it's nutritious and you'll be home soon."

"And we met some girls," said Tom.

"Oh? What are they like?" asked their mother.

"Well," replied Tim. "They're like girls."

Their mother laughed at that. "Yes, I suppose they would be," she said. "How is the weather?"

Tom answered, "There was a big solar flare."

"But it shouldn't be a problem," Tim added.

She reminded them not to forget to do their school lessons, which she didn't need to do because the computers would remind them about that, and everything else they needed to do also, but it was just her habit. Then she told them to call her when they landed on the moon and they said their goodbyes.

* * *

The three day passage went quickly. There was plenty to do. The ship's entertainment system let them play multiplayer video games with other passengers, so they played Argot of Agnostica and Dragons of Dimplecheek with Nancy and Hennu and were surprised at how well the girls played. Besides that, though, they had to keep up their lessons, which their mother had uploaded to the spacecraft for them. The computers also kept making them use the exercise features built into their couches so that their muscles and bones wouldn't grow weak from weightlessness.

When they requested the external camera's view of the moon on their video monitor, it was no longer the bright, tiny disc it had been at the start of the journey, but now filled the screen with its scarred, splotchy, silvery-gray presence. By zooming in, Tim could easily find the Peary crater where Moon One sat waiting for their arrival, but could not, of course, see any signs of human habitation yet.

But then something startling happened. The brothers had just ordered a meal and were about to retrieve it from the service compartment when the computers displayed a bright red warning on the video screen and began announcing, "All passengers must return to their cabins, be seated and fasten

restraints!" The boys were alarmed, their hearts pounding, but they immediately did as they were told.

"What could it be?" asked Tim. "Space junk?"

"No," replied Tom. "We're too far from earth for that. I don't know."

Their questions were answered quickly. "Large coronal mass ejection reported," explained the computers. "There is a twenty percent probability that it will strike the ship. As a precaution, all passengers must remain seated and secured for the next ninety minutes, until it can be determined whether there is any danger."

"CME!" cried Tom. "Coronal mass ejection! That could mess up our electrical systems!"

"But they said the ship has protection against that," protested Tim.

"I hope so," said Tom. "It's supposed to, but large CMEs don't occur so often so it's never really been tested. And it depends on how strong it is."

"Is this a strong one?" asked Tim nervously.

"It could be," said Tom. "The computers said that the solar flare that occurred when we left earth was *at least* X30, which is very strong, but it could have been even stronger."

"What will happen?" asked Tim, feeling very anxious.

"I don't know," said Tom. "Let's just hope it misses us."

For the next forty minutes, they waited, but nothing happened. The computers played soothing, relaxing music, while scenes of mountains and oceans were displayed on their monitor. Then, weird things began to happen. First, their skin began to tingle and their hairs stood on end. Soon after that, at the sharp edges of the metal service compartment door, there appeared a bright blue-violet glow and the door began to hiss and buzz. Loud popping and snapping sounds filled the air. The lights went out, the music stopped, and the video screen went blank.

The brothers were frightened. "Oh-oh!" said Tom. "This is bad!"

No sooner were the words out of his mouth than it got worse. Several fuzzy, round, red-orange balls of light the size of softballs appeared in the cabin and danced around the room, accompanied by loud, metallic groaning sounds coming from the walls of the ship. The boys watched the glowing balls, mesmerized and terrified, until finally the noises stopped and the colored lights disappeared. Then the brothers sat in darkness for several seconds until the dim glow of the ship's emergency lighting came on. As they looked into each other's faces, each could see that the other was as scared as he had ever been in his life.

"What now?" asked Tim.

Tom thought for a few moments, then called out, "Computers!"

There was nothing but silence. Either the computers were busy, or were ignoring him, or... He didn't want to think about the third possibility.

He tried one more time. "Computers!" he cried more loudly, but got no reply.

"Hey look, the door is open!" exclaimed Tim. It was true. The door to their cabin, which was normally operated by the computers, had slid open sometime during the emergency.

"It must be that it opens if the computers fail," said Tom. "That makes sense. Otherwise everyone would be locked in."

They went into the corridor and found other passengers slowly making their way out of their cabins. Soon most of them were in the lounge, dangling from tethers and asking each other what had happened, and whether they would be all right, but of course, no one knew anything for certain. Then the astronomer, Doc, arrived from his room. He seemed a little confused, but everyone looked to him for answers, first because he was a scientist, second because he was part of the crew, sort of, and

third because he was the oldest person on board. He looked quickly around, then spoke.

"For those of you who haven't met me, I'm Professor Longston Bock," he said. "I've been working up front, doing astronomical research. I'll check the crew compartment." The door to the crew area was also open so he pulled himself along the handrails and went in. A few minutes later, he came out and spoke to the anxious passengers.

"The crew are all unconscious, but alive," he announced. "The crew area has a lot of metal, much more than the passenger area, and a lot of the metal has black burn marks on it. The crew must have been exposed to electrical shock. It's the same as if they were struck by lightning."

Some of the passengers started to shout or cry. "Who is flying the shuttle?" one woman asked frantically.

"No one needs to fly it," replied the professor. "Not now. It isn't 'flying' like an airplane flies on earth. We're in space, where there's no air and no gravity. For the past three days we've been drifting towards the moon. In space, once you start moving someplace, you just keep going, even without rocket power. You need the rocket power to *stop* moving, though, so at some point, someone is going to have to pilot the shuttle. Hopefully at least one of the crew will recover by then."

"But what if they don't!" cried another passenger. "Can you fly the shuttle?"

"Unfortunately," explained the professor, "how to fly a spacecraft is one of the many, many things I know nothing about. Does anyone else know anything about piloting a space ship?"

Two hands were thrust out, in opposite directions. One of them was Tom, who was tethered to what would be the floor, if there were gravity, and the other was Nancy, who was tethered to what would be the ceiling. The professor looked up at Nancy first.

"Yes, young lady," he said. "What is your name, and what do you know about moon shuttles?"

"My name is Nancy Bascomb," she replied. "I'm a member of Navigators, and I have an achievement badge in space navigation, which I earned on my last trip to the moon by plotting the course of the shuttle."

"Well!" said the professor. "That would certainly be a helpful skill." Then he looked down at the brothers. "And you, Tom Kriket, what do you know about the moon shuttle?"

Tom was a little shy about speaking up. After all, he didn't have an achievement badge or anything, but the professor encouraged him. "Come on, Tom, tell us what you know," he said.

"My brother Tim and I, we play with the moon shuttle simulator program a lot," said Tom. "We've been 'flying' it for over a year."

"Very good!" said the professor.

"What!?" cried a passenger. "Are we going to let children fly the shuttle!? We'll crash! We'll all die!"

The professor held out his hands to calm the passengers. "Now, now," he said, "it probably won't come to that. One of the crew will be revived, or we'll get some help some other way, but just in case, it's good to know that there are those on board who have some skill and knowledge."

"No! No!" shouted a couple of the passengers. "This is terrible!" said one. "We're going to be killed, all of us!" Many of them were becoming angry and upset, and they were beginning to panic. Some were even sobbing.

Suddenly Henu, who had been quiet until now, spoke up loud and clear. "You're supposed to be adults!" she exclaimed. "But you're acting like babies! If you can't behave like grownups, then you may as well let the children run things!"

When they heard this, everyone quieted down. They felt ashamed because they knew that Henu was right. They had been letting their fears run wild instead of using their reason.

“Well stated,” said the professor. “And The Children Shall Lead,” he added, quoting the title of an episode from the old Star Trek television series that his father had showed him when he was a youngster. “Come with me, children, and let’s see what we can figure out about how to drive this bus!”

The professor and the children untethered themselves and ‘swam’ through the door to the crew area, moving about in zero gravity being a little like swimming underwater, except it was in air and you had to hold on to something.

The scene in the crew cabin was eerie. The computer screens were mostly black, but two of them were still working. The four crew members were strapped into their seats but seemed to be sleeping. To the front was a wide, narrow window, which was completely filled by a view of the lunar landscape. They were getting close. Tim went over and looked at one of the working monitors.

“The ship is in emergency mode,” he said, studying the screen. “Only basic functions are available, and everything must be done manually. There are no automated functions. Also, all communications are cut off. We can’t talk to anyone but ourselves.”

“Look!” said Nancy. “There’s an eight ball, so we can tell which way the ship’s pointing! And a sextant so we can tell our position by looking at the stars! It seems we have everything we need to find our way, once we know exactly where we are, that is.”

“Fortunately,” said the professor, “as part of my astronomical research observations, I needed to track our position very precisely, and I did, right up until the accident. I have the coordinates on my tablet. They will tell us where we are and what our course is.”

“Do you think your tablet survived the electrical storm, Doc?” asked Tim.

The professor chuckled. "I'm almost certain it did," he replied. He went to his work station and returned with a yellow pad with pencil markings on it.

"That's paper!" cried Tom. "You use paper!?"

"A little old fashioned, I know," said the professor, "but it doesn't need electricity and it doesn't get bugs, except, of course, the kind you can easily brush off with your hand." He looked it over and turned it from side to side. "And, it seems to have come through the solar storm just fine. So did this." He held up his wrist, which held a mechanical watch, and put it to his ear. "It's Swiss," he said. "Keeps just about perfect time. And I set it by the ship's clock just today. We'll also need to know the exact time if we end up having to pilot the ship."

"So," said Nancy, "the next thing we need is to figure out where we are in relation to the moon." She went over to the sextant, which would let her determine what the angle is between one of the lunar poles and a star. Because they already knew where the spacecraft was, all they needed to know now was where the moon was. Of course, they could see it, but they needed to know where it was *exactly*.

The professor went to her side. "You may be able to sight the stars Menkent, and Nunki and Atria," he said. "I can help you find them. I'll check your work myself, if you don't mind. We can't afford to make a mistake."

"You may check it if you like," said Nancy, "but I don't make mistakes."

"Oh! I'm sure you don't," said the professor, "but we always have someone check our work. It's a rule, you know."

"If it's a rule," she replied, "then yes, of course you should do it."

Nancy took the measurements and then the professor repeated the procedure, and they both agreed on the angles they had measured. The professor also noted the time.

"Now," said Nancy, "there are some difficult calculations. This is going to take some doing. And I guess I'm going to have to do them with the professor's pencil and paper!" She sighed. It was going to be slow going.

"I have something that will help with that," said the professor. He went to his work station again and came back with a large white stick with markings on it and a plastic lens attached to it.

"I know what that is!" cried Tim. "It's a slide rule! Our father has one in a glass frame on the wall in his study!"

"Yes," said the professor. "But unlike your father, I actually use it sometimes. It will let us do the calculations much faster."

And it was true. The professor followed Nancy's instructions about what to calculate and did the math on the slide rule, giving Nancy the results, which she wrote on the professor's pad of paper. Then, following the principle that the professor had taught them, about always having someone else check your work, he showed Nancy how the slide rule works and she did the calculations while the professor followed along on the yellow pad. When everything had checked out, Nancy announced the results.

"On our current course," she said, "if we don't do anything, we will swing around the moon and shoot off into space, away from the earth and the moon. No one will be able to rescue us, because if they tried, they would just be lost too. That means that we need to burn the main engine, sometime within the next ninety minutes."

"Holy cow!" said Tom. "I'd better take control and get busy with that maneuver!"

"Not so fast," said the professor. "What maneuver? We first need to decide just what it is that we're going to do."

"That's right," added Nancy. "We have two choices. We can try to land at Moon One, or we can change our trajectory to return to earth. If you ask me, I think we should return to earth."

Once we get back, we can rendezvous with the low orbit station, or they can send a rescue spacecraft to come get us.”

“But that’s a long trip, another three days!” complained Tom. “Something might go wrong. We don’t know what condition the ship is in. And, are you sure you can navigate all the way back to earth? It seems easier just to land here on the moon.”

“I agree,” added Tim. “For example, fuel is stored in eight separate tanks on this ship, each with its own pump. Even if one is working, we won’t know if all of them are good until we try to use them. So we don’t really know for sure how much fuel we have available. We don’t really know anything for sure, for that matter.”

Nancy became very annoyed. “Well, Tom, are you sure you can pilot the ship down to Moon One? That can’t be so simple. And besides, if we don’t have enough fuel to get back to earth, maybe we don’t have enough fuel to land on the moon either.”

“I’ve done it dozens of times,” said Tom. “on the simulator. I always use manual mode, because it’s no fun just letting the computer do everything. And as for fuel...”

“But you always used the computer for navigation information, didn’t you,” Nancy interrupted. “You’ve never tried it using manual calculations, I’ll bet.”

“No,” replied Tom defiantly, “but I’m sure I can, if you can give me the right numbers!”

By now, Tom and Nancy were both turning red in the face and their expressions had become stubborn and angry. It seemed like there was no way they could agree, but then Hennu spoke up.

“Cut it out, you two!” she exclaimed. “I don’t know that much about navigating in space or piloting a spaceship, but isn’t there another way? Can’t we just go into orbit around the moon? We need to do something quickly, and if we go into orbit, we’ll have time to decide afterwards what to do next, or maybe one of the crew will wake up in the meantime.”

Tom and Nancy looked at Hennu, then at each other. Tom was ashamed to admit it, but her idea did seem like the best thing to do for now. "Hennu's right," said Tom humbly. "Once we're in lunar orbit, we can decide later whether to land or return to earth."

"It won't take much fuel to enter lunar orbit," added Tim, "so it's safer because of that too."

"Yes," said Nancy. "I suppose that sounds right. OK, the professor and I will calculate the burn needed to enter lunar orbit. Professor?" She turned and saw that he had been attending to the unconscious crew members. He had a washcloth in his hand and was dabbing the face of one of them with cold water. It was a woman, the shuttle commander, and just then she let out a moan. The professor patted her face, trying to revive her, but she didn't regain consciousness.

"I don't have much hope that the crew will be able to help us any time soon," he announced. "It looks like we're going to have to do it ourselves."

Nancy and the professor started doing the calculations to determine exactly what direction the engine needed to be pointing and how many seconds it needed to burn in order to slow the spacecraft down just enough to go into orbit around the moon.

"Hennu," said the professor, "maybe you should go explain to the passengers what we're going to do and tell them to strap themselves into their seats."

"OK," she replied and started to leave the crew cabin.

"And," he added, "stay in the passenger area yourself. You may be able to keep them calm, and also there are not enough seats here for all of us."

During the burn, everyone would need to be strapped into a seat. The unconscious crew members were each strapped into a seat, and there were just two additional, unoccupied seats in front of the manual control console. "When we fire the engine,"

the professor instructed, "Tim and I will also need to go back to the passenger area. Tom, you and Nancy will stay here and conduct the maneuver."

But before they could do that, Tom would need to rotate the shuttle so that the engine was pointing in the right direction. It took about thirty minutes for Nancy and the professor to complete the calculations, then it was up to Tom to turn the ship around. The rockets that rotated the ship were small and the movements were slow, so it wasn't necessary for everyone to be strapped in for that.

The manual attitude control, which was used to change which way the ship was pointing, was a joystick. Tom could control the pitch, pushing the nose down or up by pushing the joystick forward or pulling it backwards. He could control the roll, tilting the shuttle left or right, like when an airplane makes a turn, by pushing the joystick left or right. The joystick could also be rotated by twisting it counter-clockwise to point the nose left, or clockwise to point it more to the right, which was called yaw. Each action caused small rockets to fire a short burst that would begin rotating the ship slowly in one of these directions. The spacecraft would keep rotating that way until Tom moved the joystick in the opposite direction, which would fire a short burst from a small rocket pointing the opposite way and stop the movement.

Tom lifted the safety cover on the switch that would enable the joystick. When he did, the switch lit up yellow, indicating that the switch was ready to be activated. Then he pressed the switch and it lit up red, telling him that the joystick was now active.

"First the pitch," said Tom.

"Pitch down," said Nancy. "We're going to rotate about one hundred and sixty degrees. I'll watch the eight ball."

"Tell me when there's about ten degrees to go," replied Tom.

Nancy nodded. "OK, I will," she said.

Tom pushed very gently on the joystick. They could hardly feel the movement of the ship as the small rocket fired and the ship began to rotate ever so slightly, but they could see the surface of the moon moving up through the window. Before long, they saw the edge of the moon, and then the blackness of space, and the stars.

A few moments later, Nancy, said, "All right, ten degrees to go." Then she began to count down the degrees. "Nine. Eight. Seven. Six. Five." Tom held his hand on the joystick, ready give it a slight tug at just the right moment. "Four. Three. Two. One. Zero!"

Tom gave the joystick a slight pull, the opposing rocket fired a short burst and the rotation stopped.

"Perfect!" exclaimed Nancy.

"Good job!" said the professor.

"So far so good," said Tom. "Two more adjustments to go. Next, roll."

"Just twelve degrees of roll, left," said Nancy, looking at the yellow pad that contained the results of her calculations.

"Twelve degrees left," said Tom. "Here it goes."

He gave the joystick a nudge to the left, and the stars started to rotate in the window, the ones on the left side going up, while the ones on the right went down.

"Four. Three. Two. One. Zero!" cried Nancy.

Tom pushed the joystick slightly to the right, and the rotation stopped.

"That was good. One more to go," said Nancy. "Just two degrees of right yaw."

"OK." said Tom. He twisted the joystick clockwise, then he quickly twisted the other direction to stop the rotation. The movement was so slight that they didn't even notice it.

"How's that?" he asked.

"Not quite enough," said Nancy. "One more degree."

Tom repeated the maneuver, but this time Nancy said, "Oops! Too much! Back one degree." Tom applied the opposite maneuver, and this time he got it just right.

"Very good!" said Nancy. "We're ready, professor."

The professor smiled. "Excellent," he said. "Then you'll need this." He took off his wristwatch and gave it to Nancy. "Tim and I are going to our cabins now. It's up to you two. Good luck!"

Tom and Nancy buckled themselves into the seats in front of the console, and Nancy looked at the watch and then at Tom. "About fifteen minutes until the burn," she announced. "We need to fire the rocket for eleven seconds."

Tom closed the safety cover on the joystick switch, disabling it. They wouldn't be using it during the burn, and he didn't want to bump into it accidentally and send them off course. Then he studied the manual controls for the main rocket. Nothing could be simpler, really. Like with the joystick, there was a switch to enable the rocket control and a safety cover, and just next to it, a large lever. When enabled, pushing the lever forward would fire the rocket. Release it and the rocket would shut down. He would need to hold it for eleven seconds. Nancy would count down using the professor's watch.

Even though it seemed easy, he was nervous. He knew that if he did it wrong, they might either head off into space or begin spiraling down for a crash landing on the moon, and while they might be able to recover from any error, there might not be enough time, or fuel.

Finally it was getting close to the time for the burn. Tom lifted the safety cover on the rocket engine switch, and when he pressed it, it turned red, indicating that the rocket thrust lever was active. He held his hand on the lever, barely touching it, waiting for Nancy to give the word.

"Fifteen seconds to burn," she announced.

It was so easy, he told himself. Just push the lever forward and hold it for eleven seconds. But he was getting very anxious

and his forehead was beginning to sweat. Then he heard Nancy counting down to the start of the burn. "Five. Four. Three. Two. One. Zero!"

Tom pushed the lever forward and the rocket engine fired, but the force of the acceleration pushed him back in his seat, his hand came off the lever and the engine stopped!

"Yikes!" cried Tom. He hadn't been expecting that. When he fired the rocket engine using his simulator program back on earth, there was no real engine to push him back in his father's desk chair. He wasn't used to being in a real spacecraft when he used the controls.

"Just push it again!" shouted Nancy. "Now!"

He reached forward and pushed on the lever again, and this time he was prepared for the acceleration and was able to hold the lever in the firing position.

Nancy counted down the last seconds for the burn. "Five. Four. Three. Two. One. Zero!" Then Tom released the lever and the engine stopped.

Tom was shaking and breathing hard. "I hope that worked," he said.

Nancy was also feeling the adrenalin pumping through her veins and it was making her face flush. She gave a sigh of relief. "I think so," she said, "but I'll get the professor to come back and we'll check it with the sextant just to be sure."

Tom closed the safety cover on the engine switch, disabling the control lever. The last thing he wanted was to accidentally fire the engine while people were floating around loose in the spacecraft. Tim, Hennu and the professor returned to the crew cabin, and when they checked the new trajectory of the shuttle, they found that they were in a somewhat elliptical, but stable, orbit around the moon.

It wasn't long before the shuttle commander who had moaned earlier began to regain consciousness. "What?" she said loudly. Then her eyes blinked and began to focus and she saw the

professor and the four children. "What are you doing in here?" she said angrily. "Go back to your cabins! Computers, give me system status!"

But there was no reply from the computers so the professor explained things to her. "There was an accident," he said. "We were hit by a CME, a bad one. It knocked out the computers and all communications, and you and the other crew members were struck by lightning and rendered unconscious."

The commander looked around the cabin. She glanced at the functioning monitor and saw that things were as the professor had described. "OK," she said, "but what are the children doing here? How long have I been unconscious? We need to perform a maneuver!"

"We've done it," said the professor. "The children did it, really. I've checked it with the sextant myself. We're in a stable lunar orbit. Everything is OK, for the moment."

"What!?!?" shouted the commander. "The children did WHAT!?!?"

"We did a burn," said Nancy. "We shot the moon and some stars with the sextant. The professor knew the shuttle's trajectory and helped me calculate the burn with his slide rule. I have a Navigators achievement badge in space navigation. Tom piloted the ship, and Tim helped too with his knowledge of the shuttle's engineering, but it was Hennu who convinced us to go for a lunar orbit instead of trying something more risky." As she spoke, Nancy pointed with her hand to each of the other children in turn.

The commander was flabbergasted. "A Navigators achievement badge! You did a burn! How... precious!" Then she looked at the professor. "Is the orbit really OK?"

"Yes," said the professor, "I believe it is. You should check it yourself, though."

"I will," she replied. She unstrapped herself and made her way unsteadily to the sextant. The professor showed her the

yellow pad with the calculations for their orbit and, after making a few observations, she confirmed that the shuttle was in an acceptable trajectory, safely circling the moon. Then she remembered the other passengers. "Is everyone else all right?"

"It seems so," said the professor. "The other crew members are unconscious but they are breathing normally. The passengers all seem to be uninjured."

Just then there was a metallic noise and the frame of the spacecraft shuddered slightly. "What's that!?" cried Tom.

"That's the docking port," said the commander. "It must be the emergency vehicle from Moon One. It's capable of reaching lunar orbit and docking with us." Then the lights came back on and they heard an automated announcement. "Emergency vehicle has docked. Ship's systems under control of emergency vehicle."

The next voice they heard, though, was a human voice. "Commander Charles Krikit. Permission to come aboard."

"Dad!" exclaimed Tom.

"Permission granted," said the shuttle commander.

The boys rushed back to the lounge just in time to see the door to the airlock slide open and their father come through it. Then they all came together in one big hug.

Behind Commander Krikit was a team of emergency medical technicians. The emergency vehicle computers had told them that three of the crew members were unconscious and so they hurried into the crew compartment to take care of the injured. Then the professor and the girls made their way out of the crew area and into the lounge as well.

"Computers," said Commander Krikit, "call Karen." A few moments later, the tearful face of the boys' mother appeared on the video screen in the lounge.

"Tom! Tim!" she cried. "Are you all right?"

“Yes,” replied Tim. “We’re fine. The crew were unconscious, though, and the computers got knocked out. Tom flew the shuttle into orbit!”

“What?” asked their mother, amazed.

“Well, really,” said Tom, “we all did. Tim helped with engineering, and Nancy did the navigation with the professor’s help, and it was Hennu’s idea to go into orbit instead of trying to land or return to earth.”

“You did the right thing,” said their father. “Returning to earth or trying to land on the moon under manual control with a crippled ship would have been extremely difficult and risky even for a very experienced crew.”

The professor smiled. “It goes to show,” he proclaimed, “that two heads are better than one.”

“And three heads are better than two,” said Tom, looking at Nancy.

“And four heads are better than three,” said Nancy, looking at Tim.

“And five heads are better than four,” said Tim, pointing to Hennu.

“The more heads the better,” added the professor, “even if mine only counts for half.”

The all laughed at that.

It was too risky to try to land the shuttle before all its systems were repaired and checked out, so the passengers and crew were evacuated to Moon One in the emergency vehicle. Tom and Tim had a fine ten days with their father and their new friends, then returned to earth on the next scheduled flight.

When they got back to the Barstow spaceport, their mother was waiting and threw her arms around the boys, hugging them until they thought they were going to suffocate, which made them embarrassed because Nancy and Hennu were watching. Mrs. Kriket remarked, “These must be the girls.”

“Yes,” said Tom, and he introduced them.

“So!” said Mrs. Kriket. “There’s an Interplanetary Pancakes here in the spaceport. I’ll bet that after all that space food, everyone would like some buckwheat pancakes with fresh strawberries. What do you think about that? Then there are some people who want to meet you.”

“Meet us?” asked Nancy. “Who?”

Mrs. Kriket thought about that for a moment, then replied, “Well, the whole world, that’s all. But that can wait until you’ve had something good to eat.”

Tim didn’t care so much about meeting the whole world, but a delicious stack of his favorite food was something else again. He smacked his lips and, recalling the words of another boy named Tim from a different time and place, let them all know what *his* preference was.

“Pancake us, every one!” he said.

About the Author

Steven Jon Halasz has been writing stories for friends and family since he was a teen growing up in Ohio. Now retired from a career as an attorney and software developer, he lives in Sarasota, Florida with his lovely wife Elena and writes children's stories for his two grandsons.

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